

REMARKS

The specification has been amended at page 7, line 22, to change "5.0 μm " to --0.50 μm --. In Example 12 (page 50, line 6), "spherical silica" has been changed to --the melamine-formaldehyde polycondensation product (= filler; trade name; Epostar S12, product of Nippon Shokubai Co., Ltd.) having an average particle size of 1.2 μm)--. In Example 13 (page 50, line 11), "0.14 μm " has been changed to "0.18 μm ".

The amendment to page 7, line 22, corrects a typographical error. The amendment is supported on page 7, line 18. Support for the amendment to Example 12 can be found in Example 1 where "melamine-formaldehyde polycondensation product (= filler)" was used in the preparation of the adhesive layer coating composition, as described on page 38, lines 10-12 of the specification. Support for the amendment to Example 13 can be found in Table 1 on page 59 of the specification, where the value of the root-mean-square average of roughness of the smooth-surfaced substrate surface in Example 13 is described as 0.18.

Claim 1 has been amended to:

(1) define the "smooth-surfaced substrate" in terms of its root-mean-square average of roughness as originally recited in claim 5;

(2) include the limitations of claim 6 and, especially, the limitations (a) + (b2) or (b3) + (c) and, optionally, (d);

(3) recite the chemical compositions of the individual layers;
and

(4) recite that the adhesive layer contains a pigment having an average particle size of 0.2 to 3 μm .

Claims 5, 6 and 8 have been cancelled.

New claims 17 and 18 have been added to the application.

Withdrawn claims 12, 13 and 14 have been amended for the purpose of rejoinder.

The remaining claims have been amended for consistency with the amendments as described above.

Regarding support for the amendments to the claims, the amendment to recite that the adhesive layer contains a pigment having an average particle size of 0.2 to 3.0 μm is supported by the description on page 25, lines 13-17 of the specification.

Support for the chemical compositions of the individual layers of the heat-sensitive recording material recited in the claims is found in the following parts of the specification.

Layer	Chemical composition	Page and line of the specification
heat-sensitive recording layer	containing an electron-donating compound and an electron-accepting compound	Page 30, lines 10-12
Intermediate layer	Comprising a water-soluble or water-dispersible resin	Page 35, lines 3-5 ("aqueous resin" means a water-soluble resin and/or a water-dispersible resin; see page 8, lines 4-5)
Adhesive layer	Electron beam-cured resin and a pigment having an average particle size of 0.2 to about 3.0 μm	Page 25, lines 1 - 9, Page 25, lines 13-17
Protective layer	Containing a water-soluble resin and/or a water-dispersible resin	Page 21, line 24 ("aqueous resin")

Claim 7 as amended corresponds to embodiment (1) on page 10.

New claim 17 corresponds to embodiment (2) on page 10.

New claim 18 corresponds to embodiment (3) on pages 10 and 11 of the specification.

The amendments to claim 12 find support in the corresponding amendments to claim 1.

In claim 13 (iv), "the intermediate layer (ML)" has been deleted. Support for this amendment is found in Example 9 which discloses the preparation of a heat-sensitive recording material without an intermediate layer.

Support for the amendments to the claims to recite the amount of pigment in the adhesive layer can be found on page 26, lines 12-15, of the specification.

Referring to the rejections in the Action of January 29, 2004, claims 1-11 are rejected under 35 U.S.C. §112, first paragraph. First, claims 1-11 are alleged to be based upon a non-enabling disclosure relating to the various foreign test standards recited in the claims. The Office has noted that submitting an English language translation of the various test standards will overcome the rejection.

Attached to this response are a copy and an English translation each of JIS K 7105-1981, JIS B 0601-1982, JIS B 0652-1973, and JIS P 8142-1993. Also attached is a partial translation of page 10 of Exposition ("Kaisetsu") of JIS B 0601-1982 that describes root-mean-square average of roughness.

Second, it is the position of the Office that claims 1-11 are broader than the enabling disclosure. The Office has stated that unless the (independent) claims are amended to recite the limitations of claims 3 and 5, undue experimentation will be required to obtain the recited distinctiveness of image.

The Office's position is not believed to be correct. The specification describes how to achieve the claimed distinctiveness

of image. It is not a function of the claims to provide such description. Additionally, only the limitations of claim 5 are relevant to the obtaining of the recited distinctiveness of image.

Notwithstanding that the position of the Office is at least questionable, claim 1 has been amended to include the limitations of claim 5.

Claims 1-11 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite in the recital of the protective layer as "an" outermost layer. The Office has suggested that the protective layer be recited as "the" outermost layer. The kind suggestion of the Office has been adopted.

Claims 1-11 are rejected in the Action under 35 U.S.C. §103(a) as being unpatentable over Saito et al. (JP '430) ("Saito"), Shuji et al. (JP 08-090907) ("Shuji '907") or Shuji et al. (JP 09-024667) ("Shuji '667").

Applicants respectfully submit that the cited references are insufficient to support a case of anticipation of the claims, particularly as amended, under 35 U.S.C. § 102 and are insufficient, alone or in any combination, to support a case of prima facie obviousness of the claims, particularly as amended, under 35 U.S.C. § 103(a).

The heat-sensitive recording material of the present invention has various features as defined in amended claim 1, and, among others, has the following features:

- a protective layer (= the outermost layer) which comprises a water-soluble resin and/or a water-dispersible resin, and
- an adhesive layer contains a pigment having an average particle size of 0.2 to 3 μm (in addition to an electron beam-cured resin).

This combination of features is neither disclosed or suggested in the cited references.

The structures of the heat-sensitive recording sheets disclosed in the cited references are summarized in the attached Table B. As can be see from Table B, the structures of the heat-sensitive recording sheets of Saito and Shuji '907 are similar to each other. The heat-sensitive recording sheets of Shuji '667 are different.

Comparison with Saito and Shuji '907

As compared with the heat-sensitive recording sheets of Saito and Shuji '907, the heat-sensitive recording material as defined in amended claim 1 totally differs in the chemical composition of the outermost layer (i.e., the protective layer of the heat-sensitive recording material of the present invention or the outer coating

layer constituting the gloss layer of Saito and Shuji '907). Specifically, as the resin component of said layer, a water-soluble resin and/or a water-dispersible resin (=aqueous resin) is used in the present invention, whereas an electron beam-cured resin is used in Saito and Shuji '907.

Comparison with Shuji '667

Compared with the heat-sensitive recording sheet of Shuji '667, the heat-sensitive recording material as defined in amended claim 1 differs in the chemical composition of the adhesive layer (i.e., the adhesive layer of the of the heat-sensitive recording material of the present invention or the inner coating layer constituting the gloss layer of Shuji '667). Specifically, the adhesive layer of the material of the present invention comprises an electron beam-cured resin and a pigment having an average particle size of 0.2 to 3 μm , whereas the inner coating layer constituting the gloss layer of Shuji '667 comprises an electron beam-cured resin, as disclosed in [0023] of Shuji '667. Shuji '667 also does not disclose the use of a pigment having an average particle size of 0.2 to 3 μm in the adhesive layer.

For the above reasons, the cited references do not support a case of anticipation under 35 U.S.C. § 103(a) of the heat-sensitive

recording material of the present invention as defined in amended claim 1 and the claims that depend thereon.

The cited references also fail to teach, suggest or provide the necessary motivation to one of ordinary skill in the art to modify the heat-sensitive recording materials of the prior art as required to obtain the heat-sensitive recording material of the present invention as recited in the amended claims. The prior art, therefore, fails to support a case of prima facie obviousness of the claimed heat-sensitive recording material under 35 U.S.C. § 103(a).

Notwithstanding the failure of the prior art to support a case of prima facie obviousness of the claimed heat-sensitive recording material, the heat-sensitive recording material of the present invention produces unexpected results relating to the specific pigment having an average particle size of 0.2 to 3 μm in the adhesive layer. Such unexpected results support the non-obviousness of the heat-sensitive recording material of the claims.

The unexpected results produced by the heat-sensitive recording material of the present invention are demonstrated, inter alia, by the data of Example 1 where a pigment having an average particle size of 1.2 μm was used as compared to Example 12 where a pigment having an average particle size of 1.2 μm was not used.

Specifically, whereas Example 12 exhibits only good gloss and distinctness of image, and inferior image quality (rating: 3), Example 1 achieves an unexpectedly much higher gloss and distinctness of image and excellent image quality (rating: 6). These results cannot be predicted from the prior art. The relevant data of Table 1 on pages 58 and 60 of the present application are reproduced in Table A below.

Table A

	Gloss			Distinctness of image(%)		Quality of recorded image
	Unrecorded portion 20°/75°	Low-energy recorded portion 20°/75°	High-energy recorded portion 20°/75°	Unrecorded portion	Recorded portion	
Example 1 (the invention)	44/96	47/96	43/96	96	90	6
Example 12 (comparative)	35/93	37/93	33/90	84	78	3

None of the cited references teach or suggest the use of a pigment having an average particle size of 0.2 to 3 μm in the adhesive layer or the unexpected results of such use. Saito teaches in [0026] that a white pigment having a mean particle size of 5 μm or less can optionally be added to the electron beam curable resin used in the inner coating layer constituting the gloss layer. Examples 4 and 5 of Saito et al disclose the use of such white pigment (precipitated calcium carbonate, trade name "Brilliant-15", product of Shiraishi Kogyo Kaisha, Ltd.). However,

Table 1 of Saito suggests that the use of pigment will not remarkably improve gloss, distinctness of image (or image clarity) and image quality.

The relevant data in Table 1 of Saito et al relating to gloss, image clarity and image quality are reproduced below. Table 1 clearly shows that there is no significant difference in these properties between Examples 1-3 (without pigment) and Examples 4 and 5 (using pigment).

No.	Glossiness (%)	Image clarity (%)	Image quality
Ex. 1	91	95	o
Ex. 2	92	94	o
Ex. 3	92	95	o
Ex. 4	92	95	o
Ex. 5	93	95	o

It is noted that the calcium carbonate pigment "Brilliant-15" used in Examples 4 and 5 of Saito et al has a mean particle size of 0.15 μm , as is shown in the Japanese Journal of Paper Technology, '92 Extra Edition, copies of pertinent pages (and a partial English translation thereof) of which are attached to this response. The specification of the present application notes that if a pigment having an average particle size of less than 0.2 μm is used, the

effect of improving the recorded image quality is insufficient.
(See page 25, lines 17-19, of the specification).

For the reasons explained above, removal of the 35 U.S.C. § 112 and 35 U.S.C. § 103(a) rejections of the claims is in order and is respectfully solicited.

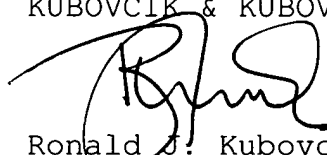
The foregoing is believed to be a complete and proper response to the Office Action dated January 29, 2004, and is believed to place this application in condition for allowance. If, however, minor issues remain that can be resolved by means of a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney at the telephone number indicated below.

In the event that this paper is not considered to be timely filed, applicants hereby petition for an appropriate extension of time. The fee for any such extension may be charged to our Deposit Account No. 111833.

In the event any additional fees are required, please also charge our Deposit Account No. 111833.

Respectfully submitted,

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PATENT APPLN. NO. 10/067,918
RESPONSE UNDER 37 C.F.R. §1.111

PATENT
NON-FINAL

Attachments: JIS K 7105-1981, JIS B 0601-1982, JIS B 0652-1973,
and JIS P 8142-1993 (copy and English translation)

Partial translation of page 10 of Exposition
("Kaisetsu") of JIS B 0601-1982

Table C (Comparison of structures of heat-resistant
recording material of invention and of cited
references)

Japanese Journal of Paper Technology, '92 Extra
Edition, (copies of pertinent pages and a partial
English translation thereof)

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